REMARKS

Claims 1-24 and 29-32 are pending in the application. Claims 3, 4, 8 and 10 have been amended to only correct typographical errors. Claims 25-28 have been canceled. In view of the foregoing amendments and the following remarks, Applicants respectfully request allowance of the application.

CROSS-REFERENCES TO PRIOR FILED APPLICATIONS

The Office Action notes that Applicants submitted Information Disclosure Statements (IDSs) which called attention to co-pending applications that are directed to related technical matter. The Office Action alleges that Applicants are required to include a specific cross-reference to the applications referenced in these IDSs under 37 C.F.R. 1.78(a)(2)(i). Applicants respectfully disagree, noting that the rule cited by the Office Action requires a cross-reference only if the current application claims the benefit of another application. The current application does not claim the benefit of the noted applications, thus no cross-reference is required.

REFERENCES MADE OF RECORD – IDS OF NOVEMBER 22, 2004

The Office Action indicates that the references cited in the IDS filed November 22, 2004 have not been considered as the Examiner believed that all of the references cited in the IDS of November 22, 2004 were previously submitted in the IDS filed May 12, 2004 (Applicants note that the first IDS was filed May 12, 2004, not May 14, 2004 as indicated in the Office Action). Applicants request that the Examiner verify consideration of at least the Huang et al. reference filed in the IDS of November 22, 2004 as this reference is not the same as the Huang et al. reference filed in the IDS of May 12, 2004. Specifically, the IDS of November 22, 2004 cited the following article:

> C L. Huang and B Y Liao, "A robust scene-change detection method for video segmentation," IEEE Signal Processing Letters, vol. 7, no.7, pp. 173-175, July 2000.

while the IDS of May 12, 2004 cited the following article:

> Chung-Lin Huang et al, "A robust scene-change detection method for video segmentation", IEEE Transaction on Circuits and Systems for Video Technology", vol. 11, no. 12, December 2001

As the two references may not be exactly identical, each reference should be separately considered by the Examiner so that both articles may each be made of record.

CLAIM OBJECTIONS

Claim 8 has been amended to address the objections to this claim.

SECTION 101 REJECTIONS

The Office rejection claims 25-28 under 35 U.S.C. § 101. Claims 25-28 have been cancelled rendering this rejection moot.

PRIOR ART REJECTIONS

Claims 1, 5, 9-13, 18-22, and 25-29 stand rejected under 35 U.S.C. § 102(b) as being anticipated by Lee et al., "Temporally Adaptive Motion Interpolation Exploiting Temporal Masking in Visual Perception." Claims 2, 6-8, and 17 stand rejected under 35 U.S.C. § 103(a) as obvious over Lee et al. in view of Lan et al., "Scene-Context Dependent Reference Frame Placement for MPEG Video Coding." Claims 3, 4, 14, and 23 stand rejected under 35 U.S.C. § 103(a) as obvious over Lee et al. in view of Liu et al., U.S. Pat. App. Pub. No. 2002/0146071 A1. Claims 15 and 24 stand rejected under 35 U.S.C. § 103(a) as obvious over Lee et al. in view of Mitchell, "MPEG Video Compression Standard." Claim 16 stands rejected under 35 U.S.C. § 103(a) as obvious over Lee et al. in view of Ohm, "Digitale Bilcodierung." Claims 30 and 32 stand rejected under 35 U.S.C. § 103(a) as obvious over Lee et al. Claim 31 stands rejected under 35 U.S.C. § 103(a) as obvious over Lee et al. in view of Ardizzone et al., "Video Indexing Using MPEG Motion Compensation Vectors."

Applicants respectfully request withdrawal of these rejections as Lee et al. fails to teach or suggest each and every feature of independent claims 1, 10, 18 and 29.

Representative independent claim 10 recites:

> A video coding method, comprising, from a sequence of video data:
>
> **determining a motion speed between a first picture and a reference picture**;
>
> for each picture following the first picture, until a termination condition is met:
>
> **determining a motion speed for the respective picture,**

> **comparing the motion speed of a respective picture with the motion speed of the first picture**, and
> **coding the respective picture as a B picture if the motion speeds are consistent with each other**; and
> when the termination is met, coding a picture as a P picture.

Lee et al. does not teach or suggest the coding method recited in claim 10. In particular, Lee et al. does not teach or suggest a coding method that codes pictures as B pictures when the motion speeds between pictures are determined to be consistent in the manner specified in claim 10.

In aspect of the present invention, the motion speeds of candidate pictures are calculated and compared to the motion speed of a first picture after a reference picture. If a candidate picture exhibits consistent motion speed when compared to the first picture, then the candidate picture can be coded as a B picture. This process can be repeated for subsequent pictures in a group of pictures until a termination condition is met – e.g., if consistent motion is no longer observed after the repeated calculation and comparison steps. Paragraphs [55]-[61] of the present application describe one method for calculating the motion speed of a candidate picture and comparing it to the motion speed of the first picture following a reference picture as follows:

> [57] According to an embodiment, motion vectors may be determined for all pixelblocks in a candidate picture. Again, let d_x and d_y by the components of a motion vector (displacements) along the x and y directions. If a scene cut does not exist between a first picture of a GOF and the preceding picture, it can be assumed that the first picture of the GOF is a B-picture (picture no. 1). Starting with the first picture (picture 1), for each picture of the GOF, the system may compute the motion speed. The motion speed of a block b in the picture may be measured by slopes $S_x(n, b)$ and $S_y(n, b)$ and $S(n, b)$ as follows:
>
> $$S_x(n,b) = \frac{d_x(n,b)}{n} \qquad (1.)$$
>
> $$S_y(n,b) = \frac{d_y(n,b)}{n} \qquad (2.)$$
>
> $$S(n,b) = S_{x+y}(n,b) = \frac{d_x(n,b) + d_y(n,b)}{n} \qquad (3.)$$

[58] Starting with picture 2, motion speed error may be calculated with respect to the motion speed of the first picture (B1) of the GOF:

$$e_x(n,b) = S_x(n,b) - S_x(1,b) \tag{4.}$$

$$e_y(n,b) = S_y(n,b) - S_y(1,b) \tag{5.}$$

$$e(n,b) = e_{x+y}(n,b) = S(n,b) - S(1,b) \tag{6.}$$

[59] Thus, an error value can be obtained for each image block in the candidate picture. The system may compute the speed error for picture n (i.e., E(n)) as the mean of absolute speed errors of all blocks in the picture, in which case E(n) is given by:

$$E(n) = \sum_{1}^{N_{blocks}} \frac{|e(n,b)|}{N_{blocks}} \tag{7.}$$

[60] where N_{blocks} represents the number of pixelblocks per picture. As long as the error of a picture is less than a predetermined threshold value, that picture may be added to a group of pictures as a B picture. If not, then the picture may be coded as a P or I picture and the current group of pictures may be terminated.

[61] The foregoing picture type decision scheme contributes to highly efficient coding of pictures. At a high level, the picture assignment scheme identifies pictures that exhibit a common motion speed and small speed errors among them. When these characteristics are identified, the picture type decision scheme classifies a relatively large number of candidate pictures as B pictures.

Claim 10 is directed to this coding method. In particular, claim 10 recites calculating motion speeds of pictures within a group of pictures and determining when to code a candidate picture as a B picture based on a comparison of motion speeds.

Lee et al. does not teach or disclose basing a decision to code a picture as a B frame on whether or not consistent motion is observed between frames. Instead, Lee et al. discloses the encoding of P frames when an error distance calculation exceeds a predetermined threshold. Lee et al. states that the distance measurements are calculations such as difference of histograms, histogram of difference image, block histogram difference, block variance difference, and motion compensation error (*See* p. 518-19 under "Distance Measures for Temporal Segmentation"). None of the distance calculations specified by Lee et al. involve the motion speed calculations and comparisons described in the present application and claimed in representative claim 10.

For example, the Motion Compensation Error (MCE) technique described by Lee et al. involves (1) coding a frame f_m based on motion estimation from a frame f_n to form a predicted frame f'_m and (2) subsequently determining the error between the actual frame f_m and the predicted frame f'_m. When the error between the actual frame f_m and the predicted frame f'_m exceeds a threshold, then a temporal segmentation point is determined. The calculations and metrics used by the MCE technique are not based on determining whether the motion speed between a candidate frame and a first frame after a reference frame are consistent. This is evident under a scenario where inconsistent motion speed between a candidate frame and the first frame after a reference frame would trigger a termination point according to the method of claim 10 but under Lee et al. would not necessarily trigger a segmentation point determination.

Further, the MCE calculation operations disclosed by Lee et al., which provide a measure of the difficulty of coding the error image between f_m and f'_m, are computationally burdensome when compared to the calculation and comparison operations recited in claim 10. Further, as noted in Lan et al., the metrics taught by Lee et al. can trigger an unnecessary segmentation point from images with high detail and high contrast even if the magnitude of motion is small – i.e., even if consistent motion between compared frames is determined. (Lan et al., p. 479). Conversely, a candidate picture exhibiting inconsistent speed as compared to the first B picture may trigger the coding of a P picture in embodiments of the present invention, while under the method of Lee et al., such a picture may not trigger a segmentation point if it exhibits similar detail and contrast to the predicted picture.

Additionally, Lee et al.'s MCE technique for determining when to flag a segmentation point requires comparing the candidate frame with a predicted version of the candidate frame. This is in contrast to the method recited in claim 10 which does not make use of such a comparison and instead exploits a comparison between the motion speed of a candidate frame and the motion speed of the first frame following a reference frame. That is, the method of claim 10 does not rely on or recite the coding of a frame and then the subsequent comparison of the actual frame and a predicted version of the frame. Furthermore, Lee et al. note that the MCE calculation is computationally expensive, as mentioned above. In particular, the encoder must generate a prediction for each frame which must be compared against the original frame itself. An aspect of the present invention provides a more efficient and computationally less complex coding decision methodology by instead focusing on comparing the motion speed of

the first picture following a reference picture (i.e., the first B picture) with the motion speed of successive candidate pictures.

Because Lee et al. does not teach or suggest the above limitations, it does not anticipate representative independent claim 10. Each of the independent claims in the present application recited similar limitations, and therefore Applicants respectfully request withdrawal of the rejection as to all pending claims.

Claims 11-17 depend from independent claim 10 and are allowable for at least the reasons applicable to claim 10, as well as due to the features recited therein.

Independent claim 1 recites limitations similar to those of claim 10. Accordingly, claim 1 is allowable over Lee et al. for at least those reasons mentioned above with respect to claim 10. Claims 2-9 depend from independent claim 1 and are allowable for at least the reasons applicable to claim 1, as well as due to the features recited therein.

Independent claim 18 recites limitations similar to those of claim 10. Accordingly, claim 18 is allowable over Lee et al. for at least those reasons mentioned above with respect to claim 10. Claims 19-24 depend from independent claim 18 and are allowable for at least the reasons applicable to claim 18, as well as due to the features recited therein.

Independent claim 29 recites limitations similar to those of claim 10. Accordingly, claim 29 is allowable over Lee et al. for at least those reasons mentioned above with respect to claim 10. Claims 30-32 depend from independent claim 29 and are allowable for at least the reasons applicable to claim 29, as well as due to the features recited therein.

REQUEST FOR INTERVIEW

Prior to issuance of a subsequent Office Action in the present application, Applicants request a telephone interview be conducted between Applicants' representatives Brett Watkins and Wesley Jones and the Examiner assigned to this application in order to advance prosecution. Applicants respectfully request the Examiner to contact Applicants' undersigned representative at the number provided below to arrange the interview based on the Examiner's availability and prior to the Examiner taking further action in this application.

CONCLUSION

In view of the above amendments and arguments, it is believed that the above-identified application is in condition for allowance, and notice to that effect is respectfully requested. Should the Examiner have any questions, the Examiner is encouraged to contact the undersigned at (202) 220-4430.

The Commissioner is authorized to charge any fees or credit any overpayments which may be incurred in connection with this paper under 37 C.F.R. §§ 1.16 or 1.17 to Deposit Account No. 11-0600.

Respectfully submitted,

Date: October 17, 2007

/Brett N. Watkins/
Brett N. Watkins
Registration No. 60,458

KENYON & KENYON, LLP
1500 K Street, N.W.
Washington, D.C. 20005
Ph.: (202) 220-4200
Fax.: (202) 220-4201